POULTRY

APPLIED LAWS OF BREEDING.

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It is a tenet of the hypothesis of evolution that the embryo is built up by the union of organic particles which are given off from every part of the body of the parent, and which, assembling in the sexual secretions, assume in the body of the offspring positions like those which they occupied in the parent. (Theory of Heridity—Buffon.) According to Huxley the hen's egg contains an excessively minute but complete chick, and that fecundation and incubation simply cause this germ to absorb nutritious matters, which are deposited in the interestices of the elementary structure of which the chick germ is made up. The ovum is a cell containing material particles each of which corresponds to a specific characteristic hereditary in that species. Each cell of the body may be considered as an individual, which has the power to grow and to give rise by division to similar cells and to throw off minute germs. During the evolution of the species, these cells acquire by natural selection specific functions adapted to the requirements of their environment. So long as the conditions remained unchanged, they continue to perform their proper functions as a part of the body; but, when the conditions are changed, and these functions disturbed so that the conditions of life become unfavorable, these germs begin to throw off small particles which are termed gemmules of that particular cell. These gemmules may be carried to every part of the body and may penetrate to an ovarian ovum, in which case the gemmule will unite with an impregnate that particle of the ovum which will give rise in the progeny to the cell which corresponds to the one which produced the gemmule; or, it may unite with a closely related particle giving rise to a closely related cell. When a cell thrown of a gemmule becomes developed in the body of the offspring it will be a hybrid, and variation will be the result, and the next generation will share by direct inheritance the tendency to vary, for a cell thus varied will continue to throw off gemmules and thus transmit variability to the corresponding part in the bodies of successive generations of descendents until such time as a favorable variation is grasped by natural selection. With the unchanged environment, the ovum which produced the organism thus selected will transmit the same variation to its ovarian ova by direct inheritance, the characteristic will be established as an hereditary race characteristic and will be perpetuated and transmitted by the selected individuals and their descendants, without gemmules.

It will thus be noted that the occurrence of variation is due to change in environment, causing a cell to throw off gemmules, and thus transmit to descendants a tendency to vary **in the part which is affected by the change.** "The series of changes in the hen's egg gives us an outline sketch of the series of ancestors. **This ancestral or Phylogenetic significance of the phenomena of ontogeny or individual development is up to the present time the only explanation of the latter."** ("Gesammelte Populare Vortrage," II., p. 103.) Thus we accept the basic law of embryology—that "Individual development is a recapitulation of the evolution of the species."

From a careful study of the foregoing, we should be able to arrive at an understanding of the ninth principle of breeding: **"Peculiarities of direct heredity are transmitted to the progeny generally from the more vigorous parent."** We should also be able to appreciate the importance of heading our selected pen with a vigorous typical male, for unless the male and females are of the same blood lines, although of the same species, the result of their union will be a cross and while there can be no doubt that what the two sexes play similar parts in transmitting characteristics, yet experience has shown that the male gemmules in every cross are predominant. Perhaps the most common and well known is the cross between the ass and a mare in which the mule inherits more particularly the type of the ass, while in a reciprocal cross between a stallion and a she-ass, the hinney inherits the type of the horse in the head, ears, legs and voice which instead of a bray, as in the mule, becomes the ordinary neigh of the horse.

We quote from Darwin: "The silk fowl breeds true, and there is reason to believe that it is a very ancient race; but when I reared a large number of mongrels from a silk hen by a Spanish cock, not one exhibited even a trace of the so-called silkiness." In a number of instances, we crossedDominique hens with a common cock and the chicks were invariably all mongrel colors, while the progeny of a cross between a Light Brahma cock and common hens were like the cock-bird in coloring and feathering, even to the toe feathers. In a cross between a Barred Rock cock and a White Orpington hen, the chicks were typical Rocks, but in color quite light. A cross between a Black Langshan cock and a White Rock hen produced black chicks.

The above illustrations will give us an idea of the importance of selecting both male and females for the breeding pen from birds that are of the same blood line if we would avoid troublesome variations that are otherwise sure to be transmitted through the male gemmules, for gemmules which are formed in the male body are more likely to be transmitted to descendants than those which develop in the female body. Thus the feathering, color and comb presented by the male in our selected pen should be as nearly standard as possible if we would reproduce this excellence in the progeny, while with the same blood lines in the females, we would expect to perpetuate size and general type, Principle VI. It will thus be noted that males are more variable than females, and that variations in the progeny will more likely develop the male characteristics, especially where blood-lines are crossed.

It will also be noted that a tendency to reversion is more apt to make its appearance as the result of a cross and thus we have Principle VIII: "Peculiarities of reversional heredity make their appearance in alternate generations." These manifestations of revision may lay dormant for many generations but we have seen from the foregoing that any change of environment that will disturb the functions of the germ cell will cause the cell to throw off gemmules and ordinarily these gemmules will germinate and reproduce their latent characteristics in alternate generations. These reversional peculiarities of heredity may be latent for hundreds of generations, but when a disturbance of the functions of that particular germ arises, a gemmule is thrown off and the peculiarity appears, but is rarely transmitted from father to son. Breeders of Buff and White Orpingtons occasionally produce chicks with feathers upon the shanks. When it is remembered that Orpintons are hybrids, and that the Cochin is a remote ancestor, it will at once be understood that this peculiarity is an instance of reversion. Breeders of White Wyandottes are aware that that variety is evolved from sports of the Silvers and is simply a variation, the result of former crossing. Note then, the difference between reversion and variation. The one is the development of a peculiarity of remote ancestry; the other is the development of a peculiarity not common to remote ancestry. Either effect may be produced by a change of environment, and one or both may result from crossing.

If we mate up a pen with a male of one blood-line with females of another blood-line, in practice the progeny will be an out-cross, and here we will have a further tendency to reversion and variation, hence Principle X: "Cross heredity is the result of an out-cross." This form of transmission usually occurs also in alternate enerations, but may be transmitted directly from sire to daughter ro from dam to son. The practice of "introducing new blood" which was once quite common is now avoided by the experienced breeder, as introducing new blood generally understood means the crossing of two distinct blood-lines. However, the introduction of new blood may be accomplished in another way, as will be shown further on, without the hazard of cross heredity.